

IDEM has reviewed the comments pertaining to legal issues, dated September 29, 2008, received from Indiana Coal Council (ICC) and their Consultant Baker & McKenzie on Busseron Creek TMDL. This section pertains to comments on the TMDL and the Clean Water Act. IDEM responses to comments are listed below:

**Comment:** No basis exists for the TMDLs because IDEM circumvented the Clean Water Act process.

**Response:** IDEM disagrees. IDEM followed the Clean Water Act process properly. While 40 CFR 130.7(c) requires the states to develop TMDLs for those water quality limited segments identified via the 303(d) listing and priority ranking, the CFR does not expressly limit TMDL development to only those pollutants. IDEM's TMDL is based on the most recent data available on the Busseron Creek water segment, and IDEM believes that a TMDL should reflect the current water quality state of a stream segment, ~~not that existing at the time of the original collection of data.~~ The 303(d) list is a starting point for states to address problems with water quality, and does not preclude the use of more recent data, which is in line with the purpose of the to turn a blind eye to whatever conditions exist in a particular segment is to defeat the purpose of the Clean Water Act. ~~US EPA, in its *Guidance for Water Quality Based Decisions: The TMDL Process* (at <http://www.epa.gov/owow/tmdl/decisions/>) states, "No TMDL will be approved if it will result in a violation of water quality standards."~~

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**Comment:** The TMDLs were developed in violation of the Clean Water Act because IDEM failed to provide adequate public comment.

**Response:** IDEM disagrees. The Busseron Creek TMDL has been public noticed and made available for comment. The comment period for the Busseron Creek draft TMDL ran from January 23 - March 5, 2008. A second public comment period for the revised draft TMDL was held June 16, 2008 through July 16, 2008. A third comment period was held from September 2, 2008, through October 3, 2008. In addition, a public meeting concerning the TMDL was held on January 31, 2008 at the Sullivan County 4-H Fairgrounds. IDEM is taking an additional step to provide formal responses to these comments, a direct acknowledgement of the open public process that has occurred with this TMDL and every other TMDL IDEM undertakes.

**Comment:** By proposing a TMDL for an impairment not identified in the 303(d) listing for the Busseron Creek watershed, IDEM effectively amended federal law without EPA approval.

**Response:** This is incorrect. It is EPA's responsibility to approve, or not, the proposed TMDL. The Busseron Creek TMDL has not yet been submitted to US EPA for approval.

IDEM has reviewed the “Technical Comments” dated September 30, 2008, received from Indiana Coal Council (ICC) and their Consultant-ENVIRON International Corp, Denver, Colorado on Busseron Creek TMDL. This section pertains to comments on Water Quality Criteria (WQC) for ~~Aluminum~~aluminum and ~~Iron~~iron related to Busseron Creek TMDL. IDEM responses to comments are listed below:

**Comment:** IDEM has not properly developed the criteria used for ~~Aluminum~~aluminum and ~~Iron~~iron.

**Response:** IDEM disagrees. Specific water quality standards for Aluminum and Feiron aquatic life criteria for Indiana’s non-Great Lakes Basin waters have not been promulgated into Indiana’s water quality standards (327 IAC, Article 2). However, provisions found at 327 IAC 2-1-8.2 and 2-1-8.3 clarify the procedures for determining aquatic life criteria for non-Great Lakes Basin waters in Indiana. Additionally, provisions at 327 IAC 2-1-13 allow for site-specific modifications to criteria as long as the modified criteria are protective of designated uses and aquatic life or human health. We applied ....

**Comment:** IDEM has not updated their toxicity database for aluminum to recent studies, even in 2005. IDEM did not reference that there was a July 2005 detailed response (from ALCOA to IDEM) requesting further technical clarification of the March 2005 Update; these technical clarifications have yet to be made. IDEM has used “the technically flawed 2005 aquatic life chronic concentration, which is presented in the form of dissolved aluminum.”

**Response:** IDEM disagrees. IDEM had calculated ~~the a~~ site-specific WQC for ~~A~~aluminum (Al) numerous times, first in 1996 for the City of Indianapolis, followed in 2002 and then finally updated in 2005. ~~The calculations~~calculations are applicable to all warm waters in Indiana outside the Great Lakes System. These site-specific WQC were calculated using toxicity data available in the 1988 ~~Aluminum~~aluminum Criteria Document from 11 Genera of aquatic organisms after removing data for cold water Salmonid species and by adding toxicity data for one more species (*Crangonyx*) to the database. To accomplish the criteria calculations, IDEM had followed the Indiana Rule 327 IAC 2-8.2 and Rule 327 IAC 2-8.3 as well as the 1985 USEPA General Guidance on criteria calculations and the procedure as outlined in the 1988 USEPA Criteria Document on ~~Aluminum~~aluminum. The recalculation of WQC using toxicity data from 12 Genera obtained from at least 5 or more different families of aquatic organisms as required by the Indiana Rule had resulted in an Acute criterion of 987 ug/L and a Chronic criterion (CAC) of 987 ug/L. The calculated Chronic criterion was then lowered to 174 ug/L to protect some aquatic organisms that dwell in Indiana warm waters. A few other points that provide support of the WQC for ~~Aluminum~~aluminum developed by IDEM are as follows:

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1. During the course of criteria development for ~~Aluminumaluminum~~ and its update in 2005, IDEM ~~had~~ consulted with the USEPA and incorporated various EPA's recommendations about acceptability or non-acceptability of various toxicity data suggested by ALCOA into the criteria calculations for ~~Aluminumaluminum~~. Having done all of the above, IDEM strongly feels that the calculated WQC for ~~Aluminumaluminum~~ are valid and could be used with confidence for water quality assessment in warm waters outside the Great Lakes System. It must be pointed out that the IDEM-derived Chronic criterion for ~~Aluminumaluminum~~ is **174 ug/L** which is at least **2x** higher than the **87 ug/L** Chronic criterion derived by USEPA. Also, lowering of the calculated Chronic value from 987 ug/L to 174 ug/L for ~~Aluminumaluminum~~ by IDEM is in concurrence with the 1994 USEPA's Recalculation Procedure Guidance on water quality criteria (see EPA-823-B-94-001) which states that, "The calculated FAV (Final Acute Value), CMC (Criterion Maximum Concentration) and/or CCC (Criterion Continuous Concentration) must be lowered, if necessary, to (1) to protect an aquatic plant, invertebrate, amphibian or fish species that is a critical species at the site ---." A historic perspective and a detailed discussion on development of WQC for ~~Aluminumaluminum~~ by IDEM including Comments to the ~~Aluminumaluminum~~ criteria calculated by ALCOA was provided in the "**Site-Specific Water Quality Criteria (WQC) for ~~Aluminumaluminum~~: 2005-An Update**", dated March 2005.

2. IDEM provided to ALCOA in depth responses, comment-by-comment, through IDEM Legal Counsel, Matt Gernand on July 25, 2005. A copy of this IDEM Response document to comments received from ALCOA dated July 6, 2005, is enclosed herewith for immediate reference. This IDEM Response document had several references to the previous March 2005 update from IDEM, and since both of these documents go together hand in hand; a copy of the IDEM March 2005 update is also enclosed for reference. A copy of the original July 6, 2005, comments document from ALCOA submitted through their Legal Counsel (Barnes and Thornburg) is also enclosed to tally each ALOCA comment with the responses provided by IDEM in the IDEM Response document of July 25, 2005.

3. Not all published or unpublished articles would be acceptable for criteria calculations. For example in the ALCOA submittal of WQC for ~~Aluminumaluminum~~, except for *Crangonyx* species from 1986 publication, toxicity data for *Daphnia* and *Tubifex* species from 1989 and 1991 publications respectively were not acceptable for criteria calculations for ~~Aluminumaluminum~~.

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4. IDEM will revise the ~~a~~Aluminum criteria after USEPA has completed its work on ~~a~~Aluminum criteria issues, but until then the site-specific WQC for ~~a~~Aluminum updated by IDEM in 2005 would be applicable and used in water quality assessment of warm waters in Indiana outside the Great Lakes System.

Additionally, IDEM had developed the WQC for ~~Aluminum~~aluminum under Article 2 and its applicable two rules, cited previously, before the Indiana fast track rule became effective in October 2005. Therefore, these or any other site-specific WQC developed earlier to October 2005 do not have to go through the approval process by the Water Pollution Control Board (WPCB) or the USEPA.

If IDEM were to update the toxicity data on ~~Aluminum~~aluminum in the future and calculate a new set of WQC for ~~Aluminum~~aluminum, the criteria numbers, especially the Chronic criterion of 174 ug/L, is not expected to significantly change. Similar to USEPA, IDEM would have to still lower the newly calculated Chronic criterion value for ~~Aluminum~~aluminum to protect the surrogate of Stripped bass such as Largemouth bass (*Micropterus* spp.), Goldfish (*Carassius* spp.) and Narrow-mouth toad (*Gastrophryne* spp) that occur widely distributed in Indiana warm waters and at a pH range of 7.2 to 8 have 7 - 8 days lower EC<sub>50</sub> values of **170 mg/L**, **150 ug/L** and **50 ug/L**, respectively.

**Comments:** The IDEM memorandum issued in 1997 was not based on a complete list of studies on the aquatic toxicity of iron, in addition the studies that were presented did not undergo data validation and assessment of acceptability, and finally IDEM mixed the toxicity data results for iron (+2), ferrous and iron (+3) ferric in developing a database for iron. It is commonly accepted that species of iron most toxic to aquatic life is ferrous iron, not ferric,

**Response:** EPA has put out a criteria on ~~Iron~~iron in the 1976 Red Book. In this document, based on the limited toxicity information available, EPA had identified 1 mg/L as the Chronic criterion for ~~Iron~~iron but provided no acute criterion for ~~Iron~~iron. This being the case and IDEM as well as many NPDES Permittees needing WQC for ~~Iron~~iron for water quality assessments and for effluent discharges to warm waters in Indiana outside the Great Lakes System, in 1997 IDEM had calculated the WQC for ~~Iron~~iron. To accomplish this, IDEM obtained majority of toxicity data on ~~Iron~~iron from USEPA AQUIRE Database and some data from published literature. Once again, to calculate the WQC for ~~Iron~~iron, IDEM had followed the Indiana Rule 327 IAC 2-8.2, Section (1) and Rule 327 IAC 2-8.3 as well as the USEPA General Guidance on criteria calculations. The WQC for ~~Iron~~iron calculated from toxicity data of 10 Genera collected from 5 or more different families of aquatic organism as required by the Indiana Rule had resulted in an Acute criterion of 2,744 ug/L and a Chronic criterion of 2,495 ug/L.

IDEM feels comfortable with the WQC calculated for ~~Iron~~iron and stands behind it. Moreover, IDEM derived Chronic criterion for ~~Iron~~iron is **2,495 ug/L** which is almost **2.5x** higher than the **1000 ug/L (1 mg/L)** Chronic criterion for ~~Iron~~iron proposed by USEPA in the 1976 Red Book. Contrary to this, if IDEM was to follow the guidance in Indiana Rule 327 IAC 2-8.2, **Section (2)**, and use the lowest Species Mean Acute Value

(SMAV) of 7300 ug/L available then for the *Daphnia* species, the Chronic criterion for ~~Iron~~iron would have been in and around **166 ug/L** or **664 ug/L** as compared to the **1 mg/L (1000 ug/L)** Chronic criterion from USEPA.

Both USEPA and IDEM are equally aware of the various issues related to WQC for ~~Iron~~iron. IDEM will revise the ~~Iron~~iron criteria as more toxicity data on various species of ~~Iron~~iron become available, but until then the WQC for ~~Iron~~iron developed by IDEM in 1997 using Indiana Rule 327 IAC 2-1-8.2 and 327 IAC 2-1-8.3 is applicable for and used in water quality assessments of warm waters in Indiana outside the Great Lakes System.

**Comments:** Clarify if the aquatic toxicity data bases address total or dissolved aluminum, the relationship to pH, iron (+2) or iron (+3). • It is important to note that in regards to metals associated with biological impairment it is the dissolved form of the metal that is commonly accepted as the bio-available form that impacts biological organisms. • Total concentrations often include particulate and unavailable bound forms of the metal that typically have minimal impact on chemical toxicity to fish and other organisms.

**Response:** IDEM offers the following responses:

1. As described above, from reasonable to very limited toxicity data were available on ~~Aluminum~~aluminum and ~~Iron~~iron, respectively. Consequently IDEM had to use the maximum amount of data that was good and available to calculate the WQC for ~~Aluminum~~aluminum and ~~Iron~~iron in 2005 and 1997, respectively.
2. USEPA and IDEM recognize that dissolved forms of metal are more toxic than total and in most natural aqueous systems. Most metals bind to suspended solids in the water and render them less bioavailable or less toxic. Compared to the bound forms; both ~~Aluminum~~aluminum and ~~Iron~~iron also exist as hydroxides in waters and are regarded as dangerous forms that may be harmful as well as toxic to many aquatic organisms. Additionally, dilute ~~Aluminum~~aluminum solutions are known to form particles and large insoluble polynuclear complexes known as flocs as a function of organic acids and hydroxide ions in surface waters. Even laboratory studies conducted in alkaline pHs have reported formation of flocs in the exposure chambers. These flocs of ~~Aluminum~~aluminum tend to settle down and have been reported to blanket a stream bed. It is possible that such ~~Aluminum~~aluminum flocs might even impact the many bottom-dwelling organisms, see the 1988 ~~Aluminum~~aluminum Criteria Document.
3. ~~Aluminum~~aluminum is also known to be toxic at low pH and at pH <7.0 or at acidic pH, even bound form of ~~Aluminum~~aluminum may

become dissolved in acidic environment such as associated with the gills and gut of aquatic organism rendering the same metal as more soluble and toxic to aquatic organisms than otherwise expected. Therefore, it is incorrect to say that only the soluble but not the bound or insoluble ~~Aluminumaluminum~~ in water is not likely to cause toxicity and harm to aquatic life.

4. With regard to ~~Ironiron~~, IDEM recognizes that similar to ~~Aluminumaluminum~~, ~~Ironiron~~ exists in many chemical forms in water such as chlorides, hydroxides etc. Besides, there are always some ~~Ironiron~~ species that exists both in soluble or Ferrous ( $\text{Fe}^{+2}$ ) and insoluble or Ferric ( $\text{Fe}^{+3}$ ) form in the water. It is well known that as compared to the Ferric ( $\text{Fe}^{+3}$ ) ~~Ironiron~~, it is the soluble form of ~~Ironiron~~ ( $\text{Fe}^{+2}$ ) that is more toxic to aquatic life. Also, similar to ~~Aluminumaluminum~~, ~~Ironiron~~ remains dissolved as long as the water is acidic and become toxic to aquatic organisms. This is also likely to happen in the acid environment associated with the gill and gut of aquatic organisms. Even otherwise, at alkaline pH (i.e. at  $\text{pH} > 7.0$  and above) or due to aeration in ambient waters, most of the dissolved ~~Ironiron~~ species are hydrolyzed and subsequently oxidized to insoluble ~~Ironiron~~ compounds. The Insoluble iron in turn may precipitates out and settles down at the bottom of streams and river beds creating smothering effects that could be particularly detrimental to fish eggs and bottom-dwelling fish food organisms. It is also well known that even the insoluble ~~Ironiron~~ present as hydroxides in water at low to high concentrations may cause respiratory distress and results in damaged gills and in increased susceptibility to diseases and thus be harmful to aquatic life.

5. Finally, both USEPA and IDEM realizes that for calculation of ~~WQC WQC~~ not only for ~~Aluminumaluminum~~ and ~~Ironiron~~ but even for many other metals, it would be ideal to have WQC calculated for soluble metals. But because of the various chemical and physical conditions discussed above, (e.g., water pH and aeration etc.) it is difficult to conduct aquatic toxicity tests where metals are always present in the soluble form during the entire test period. For example, such as with ~~Aluminumaluminum~~ at an alkaline pH in the test solution or with ~~Ironiron~~ at alkaline pH and aeration in the test chamber, this may render some of the soluble form of ~~Aluminumaluminum~~ or ~~Ironiron~~ metal into an insoluble form. Of course one can measure both soluble and insoluble forms of metal in the test solutions, but majority of the toxicity data currently available for either ~~Aluminumaluminum~~ or ~~Ironiron~~ is devoid of such clear cut information. Consequently, IDEM had to depend on the toxicity data for ~~Aluminumaluminum~~ available in the National Database (~~Aluminumaluminum~~ Criteria Document) and other sources referenced in the IDEM March 2005-Update, and for both species of ~~Ironiron~~ ( $\text{Fe}^{+2}$  and  $\text{Fe}^{+3}$ ) or total ~~Ironiron~~ on toxicity data retrieved from the USEPA AQUIRE Database and some from published literature. A statement to this effect on data sources for both ~~Aluminumaluminum~~ and ~~Ironiron~~ was already included in the IDEM March 2005-Update and in the 1997 IDEM

memorandum that are referenced in the “Technical Comments” received from ICC to Busseron Creek TMDL. Furthermore, as recommended by USEPA, IDEM had to treat this entire toxicity data equivalent to acid-soluble fraction to calculate the WQC for ~~Aluminum~~aluminum and ~~Iron~~iron and implement them for water quality assessments appropriately as dissolved or total recoverable metal. An alternative to this approach, Conversion Factors to convert from Total to Dissolved metal or vice-versa would have been ideal, but unfortunately unlike for many other metals no such Conversion Factors for either ~~Aluminum~~aluminum or ~~Iron~~iron are available from USEPA at this time.

IDEM has reviewed general comments, dated September 29, 2008, received from Indiana Coal Council (ICC) and their Consultant Baker & McKenzie on Busseron Creek TMDL. IDEM responses to comments are listed below:

**Comment:** Use of one result to characterize a site (Station 5) is highly problematic, particularly given the role of total suspended solids and flow on concentrations of aluminum and iron.

**Response:** The reference and single data point at Station 5 has been removed.

**Comment:** The dissolved aluminum data for Station 2 is greater than expected given the pH is greater than 6, based on the USGS field data. Given the dissolved aluminum varied from Non-Detect to 7,430 ug/L, field or lab contamination or ineffective field filtration could be indicated. It would have been extremely useful, given the relationship of aluminum solubility and iron solubility to pH for field pH to have been generated concurrent with sample collection.

**Response:** Field data has been added to document to provide additional clarity.

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**Comment:** The dissolved aluminum data for Station 11, as compared to the two data sources for total aluminum data, appear aberrant. It is not technically possible to have greater levels of dissolved aluminum compared to total aluminum. Again, field or lab contamination or ineffective field filtration or sample bottle mis-labeling could be indicated.

**Response:** These samples were not used in the calculations. This has been clarified in the document.

**Comment:** The dissolved iron data for Station 12 (only two samples) is highly questionable and the ICC will advise against using this dataset as valid and representative.

**Response:** Based on the level of exceedance, knowledge of the watershed and other samples in the watershed this station has been determined to be impaired.

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**Comment:** IDEM has not connected ~~Aluminum~~aluminum or ~~Iron~~iron levels to the IBC Scores

**Response:** The statement that these are connected has been removed from the document. These impairments are not dependent on each other. While the data does support a connection to these impairments IDEM is not drawing a direct correlation.

**Comment:** ICC would recommend that IDEM provide a summary as provided in the comments.

**Response:** IDEM has provided a summary of the data at each individual station. This summary does include the mean but also includes the maximum and minimums at the station. IDEM has determined that this information gives a better representation of the station rather than multiple averages.

**Comment:** ~~Aluminum~~aluminum is the most abundant metal. A little soil-related suspended solid can significantly impact the total aluminum concentrations.

**Response:** IDEM agrees that aluminum is abundant within soils. But when the data for Busseron Creek is reviewed for aluminum it becomes clear that soils are not the issue. Many of the sites where aluminum samples were collected showed no detections of aluminum. This lack of aluminum in the same soil and landuse type throughout the watershed provided the information that aluminum in Busseron Creek is not elevated due to soil type.

**Comment:** IDEM must include additional explanation and technical discussion on the methodology of how the TMDL will be modified as needed to account for any allocation changes. At a minimum, a discussion of “as needed” should be included along with a description of what steps will be taken to determine the revised WLA.

**Response:** A methodology for revising TMDLs has not been developed. If a facility applies for a NPDES permit in a TMDL area, that facility will receive a permit that insures that the facility will not cause or contribute to a violation of water quality standards. All WLA in TMDLs have been developed to follow these same guidelines. This will insure that the permit limits do not conflict with the TMDL report.

**Commented [19]:** Does this answer the “as needed” question?

**Comment:** Use of a surrogate watershed for determination of the hydrologic conditions of Busseron Creek Watershed for TMDL modeling purposes without ground truth calibration within the Busseron Creek watershed continues to be a concern.

**Response:** The use of surrogate watersheds is an accepted TMDL process. The TMDL follows the procedures outlined in U.S. Environmental Protection Agency’s *Options for Expressing Daily Loads in TMDLs*. Office of Wetlands, Oceans, & Watersheds. Washington, DC (2007).

**Commented [110]:** Why do we use this methodology? i.e. resources issue...

**Comment:** The TMDL does not calculate the relative error of flow data as outlined in the QAPP.

**Response:** The QAPP outlines procedures that may be needed in the TMDL process. The inclusion of a process to calculate the relative error in flow data does not necessitate the need to collect flow data but outlines the process if additional flow data is found.

IDEM has reviewed comments, dated September 29, 2008, received from the Sierra Club. IDEM responses to comments are listed below:

**Comment:** The implementation section of the draft TMDL is inadequate. The brief summary of Department of Natural Resources projects to remediate abandoned mine lands doesn't address the questions of how much it will cost to restore the biological community harmed by mine runoff and who should be responsible for these costs. Similarly, the simple recital of agricultural best management practices and public information requirements for proper septic system maintenance doesn't help provide any meaningful direction for reducing nutrient impacts in the watershed.

A TMDL implementation section should contain the following elements: (1) recommended actions to reduce pollutant loadings; (2) the estimated cost of such actions; (3) identification of the organizations that will be responsible for the implementation of those actions; and (4) a timeline for completion of the actions. These elements should be added to the TMDL before IDEM considers it to be final.

**Response:** IDEM agrees that implementation of the TMDL is an important priority. IDEM has currently decided to use 319 funds and watershed groups to implement TMDLs. This approach has lead to not including specific best management practices in the TMDL. This allows for flexibility in the watershed groups to best define the needed actions in their watersheds. The level of detail outlined in this comment is not currently required in a TMDL by USEPA, but IDEM is currently reviewing the implementation portion of the TMDL and will be making changes in the future. IDEM will take the actions outlined in these comments into consideration when the TMDL implementation strategy is revised.